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An Announcement of Recent Acquisitions. . .

HSL No. 71-29 November 19, 1971

HS-010 079 - HS-010 168, HS-800 505, HS-800 509, HS-800 513 & HS-800 515 & HS-800 51

**HSL No. 71-29
November 19, 1971**



THIS ISSUE CONTAINS:

HS-010 079 - HS-010 168
HS-800 505, HS-800 509,
HS-800 513 & HS-800 515
HS-800531

INTRODUCTION

Publications announced in *Highway Safety Literature* include the most recent additions to the collection of the NHTSA Scientific & Technical Information Service. Subject areas covered include all phases of highway, motor vehicle, and traffic safety, especially those encompassed by the National Traffic and Motor Vehicle Safety Act of 1966 and the Highway Safety Act of 1966.

Individual issues of *HSL* are numbered according to the year and the issue number within that year; thus, 71 designates the year and 1, 2, 3, etc. the individual issues. To aid the user in location citations by the HS-number, the cover bears the inclusive entry numbers for each issue.

Entries in *HSL* are arranged according to the revised NHTSA Subject Category List shown in the Table of Contents. The list is a two-level arrangement consisting of five major subject fields subdivided into 59 subject groups. Documents related directly to the National Highway Traffic Safety

Administration (NHTSA) are announced in a separate section headed NHTSA DOCUMENTS and are numbered in five distinct series: NHTSA Accident Investigation Reports (HS-600 000 series), NHTSA Compliance Test Reports (HS-610 000 series), NHTSA Contractors Reports (HS-800 000 series), NHTSA Staff Speeches, Papers, etc. (HS-810 000 series), and NHTSA Imprints (HS-820 000 series). For NHTSA DOCUMENTS in series HS-600 000 and HS-610 000, individual full case reports are available for inspection at the National Highway Traffic Administration. HS-800 000 series and HS-820 000 series are available for sale/or purchase from NTIS or GPO (see page ii). Although announced together in a separate section, these documents are also assigned specific subject categories for machine retrieval.

A document which contains a number of separate articles is announced as a complete volume in the subject category most applicable to it as a whole. Entries for the individual articles appear in their most specific subject category.

SAMPLE ENTRIES

Subject Category Array	HS-800 218 Fld. 5/21; 5/9	HS-004 497 Fld. 5/19
NHSB Accession no.....	AN INVESTIGATION OF USED CAR SAFETY STANDARDS-SAFETY INDEX: FINAL REPORT. VOL. 6 - APPENDICES G-L	AUTO THEFT THE PROBLEM AND THE CHALLENGE
Title of document.....	by E. N. Wells; J. P. Fitzmaurice; C. E. Guilliams; S. R. Kalin; P. D. Williams	by Thomas A. Williams, Sr.
Personal author(s).....	Corporate author.....	Published in <i>FBI Law Enforcement Bulletin</i> v37 n12 p15-7 (Dec 1968)
Collation.....	Journal citation	Gives figures on the extent of the auto theft problem and comments on antitheft devices available now or in the planning stage.
Publication date.....	12 Sep 1969 150p Contract FH-11-6921 Report no. ORI-TR-553-Vol-6; PB-190 523	Search terms: Theft; Theft protection; Stolen cars
Abstract.....	Appendices G-L to this study of used car safety standards include: indenture model diagrams for classes I-IV motor trucks; degradation, wear, and failure data for motor truck classes I-IV; and safety index tables for classes I-IV motor trucks.	
	Search terms; Wear; Trucks; Failures; Used cars; Inspection standards	

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NOTE: Material published in Highway Safety Literature (HSL) is intended for the information and assistance of the motor vehicle and highway safety community. While brand names, equipment model names and identification, and companies may be mentioned from time to time, this data is included as an information service. Inclusion of this information in the HSL should not, under any circumstances, be construed as an endorsement or an approval of any particular product, course, or equipment by the U. S. Department of Transportation, National Highway Traffic Safety Administration.

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Department of Transportation personnel may borrow copies of publications directly from the NHTSA. Outside the Washington, D.C. area, phone (202) 426-2768. In Washington, D.C. area, use government ID, phone 118-62768. Non-DOT personnel should contact their company or agency libraries for assistance.

Journals cite^a may be obtained through most research libraries.

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film; reader required) \$0.95.

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HRB: Highway Research Board, National Academy of Sciences, 2101 Constitution Ave., N. W., Washington, D. C. 20418.

NHTSA: National Highway Traffic Safety Administration General Services Division, Washington, D.C. 20591 (Telephone (202) 426-0874),

SAE: Society of Automotive Engineers, Dept. HSL, 2 Pennsylvania Plaza, New York, N.Y. 10001. Order by SAE report numbers. Prices given are list; discounts are available to members and sometimes to libraries and U. S. Government Agencies. Prepayment is required; orders without payment are subject to a \$1 handling charge.

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1/0 ACCIDENTS**1/1 Emergency Services****HS-010 079 Fld. 1/1****MISSISSIPPI STATE U DEVELOPS TOTAL EMERGENCY MEDICAL CARE SYSTEM**

by J. Edwin Clark

Published in *Traffic Safety* v71 n4 p22-4, 38 (Apr 1971)

A 15-month study in Mississippi is described. Helicopter ambulances and a radio communication system were used to improve emergency medical care. Recommended steps for upgrading emergency medical services are: (1) Establish a statewide emergency medical radio communications network that incorporates hospitals and ambulances on a common statewide emergency frequency compatible with that of adjacent states; (2) Establish training requirements in emergency medical care for ambulance personnel; (3) Determine if adequate coverage is provided by the existing ground ambulance service by use of a method such as time-advantage maps.

Search terms: Emergency medical services; First aid; Ambulances; Helicopter ambulances; Emergency reporting systems; Ambulance personnel training; Radio communication; Time factors

1/4 Locations**HS-010 080 Fld. 1/4; 1/5; 2/4****ACCIDENT OCCURRENCE IN RELATION TO ROAD LAYOUT AND TRAFFIC FLOW**

by Ole Thorson

Published in *Technical Aspects of Road Safety* n3 p5 1-5, 16 (Sep 1968)

By use of electronic data processing, correlations were made on information about the main Danish road system, traffic volume, and accidents. A literature study examined relations between number of lanes, traffic volume, and accidents. Models of accident occurrence and a system for determining high-risk locations were developed. Data on some 20,000 accidents in Denmark were analyzed.

Search terms: Two lane roads; Traffic lanes; Accident location; Accident risk forecasting; Accident rates; Highway accident potential; Accident statistics; Four lane highways; Rural highways; Statistical analysis; Denmark; Simulation models; Electronic accident analysis; Poisson density functions; Traffic volume

1/5 Statistical Data**HS-010 081 Fld. 1/5****RURAL STATE HIGHWAY SYSTEM ACCIDENT REPORT, 1963**

Alaska Dept. of Highways

[1964] 35p

Prepared in cooperation with Bureau of Public Roads.

This report presents 1963 traffic accident data on the rural federal aid highway system upon which selective enforcement, traffic engineering improvement programs, and construction programs can be based in an effort to effect a maximum of operational safety. The first two sections of this report are a listing of pertinent accident data by state control section in sequence by federal aid highway number. The third section of this report is a tabulation of accident rates from the highest to the lowest. This listing, which combines the primary and secondary highways into one group, gives a ready indication of which roadway sections are experiencing the highest accident rates in the state and where any

Search terms: Accident statistics; Interstate Highway System; Accident rates; Traffic volume; Alaska; Accident costs; Fatality rates; Injury rates; Accident location; Accident types; Vehicle mileage; Primary highways; Rural accidents; Rural highways

HS-010 082 Fld. 1/5**ROAD ACCIDENT RATES BY NUMBER OF VEHICLES ON THE REGISTER AND MILES OF TRAVEL**

by L. A. Foldvary

Published in *Australian Road Research* v3 n9 p72-89 (Mar 1969)

The inadequacy of expressing road accident, involvement, injury, and fatality rates relative to 10,000 motor vehicles on the register is discussed from both theoretical and practical points of view. Road accident involvement rates expressed in 100 million miles of performance, of the two sexes, and of the various age-groups of drivers are presented, classified according to various areas of occurrence, days of week, periods of the day, vehicle occupancy, and severity of the accident.

Search terms: Urban accidents; Accident types; Accident statistics; Rural accidents; Accident risks; Accident rates; Accident severity; Day of week; Statistical analysis; Australia; Time of accidents; Injury rates; Fatality rates; Vehicle mileage; Driver age; Driver sex; Vehicle registration; Age factor in accidents; Sex factors in accidents

HS-010 083 Fld. 1/5**TRAFFIC ACCIDENT STATISTICAL SUMMARY, JAN. THROUGH JUNE 1969**

Pennsylvania Dept. of Highways

HS-010 083 (Cont'd.)

Accident statistics are summarized by many factors: object hit, injuries, fatalities, property damage, day of week, hour of day, month, county, weather, road and light conditions, type of street location, vehicle type, causal factors, type of vehicular movement, driver's age and sex, pedestrian actions, vehicle type, and seat position. All factors are compared to accident severity.

Search terms: Accident causes; Day of week; Accident location; Accident rates; Time of accidents; Accident severity; Accident statistics; Fatality rates; Injury rates; Driver age; Driver sex; Property damage accidents; Pennsylvania; Accident types; Age factor in accidents; Sex factors in accidents; Environmental factors; Fixed objects; Seat occupation

HS-010 084 Fld. 1/5; 1/3

NOTES ON ROAD ACCIDENT STATISTICS

by H. D. Johnson; F. Garwood

England Road Res. Lab.

1971 28p 26 refs
Report no. RRL-LR-394

The Road Research Laboratory has organized courses in traffic and safety for the benefit of police officers and highway engineers for a number of years. The notes for one of the lectures, dealing with accident statistics, form the basis of this report. It includes sections on the sources of statistics, the objects of, and techniques employed in, statistical studies of accidents, together with a number of tables showing trends in accidents and casualties in Great Britain over a number of years, which illustrate the statistics available.

Search terms: Accident statistics; Accident causes; Accident rates; Fatality rates; Bicycle accidents;

tion; Accident costs; Injuries by age; Accident risks; Pedestrian fatalities; Accident severity; Fatalities by age; Moped accidents; Great Britain; Police reports; Accident research; Age factor in accidents; Road Safety Act of 1967 (Great Britain); Day vs night accidents

2/0 HIGHWAY SAFETY

HS-010 085 Fld. 2/0

THE FEDERAL EMPHASIS

by John A. Volpe

Published in *Journal of American Insurance* v46 n4 p10-2 (Sep-Oct 1970)

The Department of Transportation's program to reduce the auto accident fatality rate is outlined: development of air bags, the building of an experimental safety car, completion of the interstate highway system, and alcohol countermeasures.

Search terms: Fatality rates; Highway safety programs; United States government; Air bag restraint systems; Safety cars; Restraint system usage; Drinking drivers; Insurance; Accident costs; Driver characteristics

2/4 Design and Construction

HS-010 086 Fld. 2/4

FLORIDA SKID CORRELATION STUDY OF 1967. SKID TESTING WITH TRAILERS. HPR-1 (4), PT. 2

by L. L. Smith; S. L. Fuller

Florida State Road Dept.

1968 116p 10 refs
Report no. Res-Bull-125

Prepared for presentation at American Society for Testing and Materials, Atlanta, 29 Sep-4 Oct 1968.

cooperation with the Bureau of Public Roads, conducted a skid resistance correlation study at Dunnellon Airport in Marion County, Florida, during October and November, 1967. Twenty different organizations participated in the testing. Principal objective of this study was to evaluate the degree of standardization achieved by several skid test trailers constructed in accordance with the newly developed ASTM Test for Skid Resistance of Pavements Using a Two-Wheel Trailer. The experimental design for the trailer tests included zoning of the test pavements and randomized testing sequence to equalize the differences within a given surface and to reduce the effect of extraneous variables. The trailers were tested at 20, 40, and 60 mph. Good reproducibility was obtained with trailers utilizing their self-watering systems even though large differences resulted between the trailers. Texture measurements were made on all surfaces.

Search terms: Florida; Skid resistance tests; Wet skidding; Pavement surface texture; Pavement skid resistance; Test equipment; Trailers; Standardization; Pavement skidding characteristics; Statistical analysis

HS-010 087 Fld. 2/4

STRUCTURAL SYSTEMS IN SUPPORT OF SAFETY: NEW HIGHWAY STRUCTURES DESIGN CONCEPT. FINAL REPORT. VOL. 3. SUPPORTING DATA

by Joseph E. Minor; Maurice E. Bronstad

Southwest Res. Inst.

1969 142p 154 refs
Contract FH-11-6638
Report no. PB-187 713

Cover title: *New Structures Concepts for Highway Safety. Vol. 3: Supporting Data.*

This volume contains supporting data for both Volume 1 (Research Information) and Volume 2 (Preliminary

Designs and Engineering Data). A bibliography of literature reviewed during the concept identification process, detailed methods of analysis for eight bridge concepts given design attention, and engineering data for two concepts not selected for detailed attention are included. Calculations for bridge concept preliminary designs, computer programs, and sign and lighting system analysis methods, including comments on dynamic analysis, are included as augmentative information for the highway engineer who wishes to pursue, in detail, one or more of the design concepts presented in Volume 2. Methods of analysis, computer program listings, and computer program printouts for the preliminary designs presented in Volume 2 are also contained herein.

Search terms: Structural design; Highway bridges; Bridge design; Computer programs; Lighting design; Sign supports; Structural analysis; Engineering drawings; Specifications; Mathematical analysis

AVAILABILITY: NTIS

HS-010 088 Fld. 2/4; 2/9

SPECIAL RUMBLE SEAL COAT STRIPS FOR TRAFFIC WARNING, FINAL REPORT

by G. R. Korfhage

Minnesota Dept. of Highways

1968 28p refs
Report no. Special-study-279

Aggregates of several types and gradations were used with bituminous binders to construct rumble strips at nine rural intersections controlled by stop signs. Average daily traffic ranged from 650 to 2,700 cars. Construction is described and performance evaluated for periods up to three and one-half years. The most effective materials were RS-3K bituminous binder with coarse aggregate (3/4-inch minus ungraded material) followed by a

Search terms: Rumble strips; Road materials; Binders; Bituminous materials; Aggregates; Pavement wear; Accident prevention; Rural roads; Minnesota; Rural intersections

HS-010 089 Fld. 2/4; 5/22

INVESTIGATION OF TIRE-ROAD TRACTION PROPERTIES

by F. D. Smithson; F. H. Herzegh

General Motors Proving Ground

1971 17p 3 refs
Report no. GM-Eng-Pub-4411

Prepared for presentation at SAE Automotive Engineering Congress, Detroit, 11-15 Jan 1971.

Tire traction performance is dependent on both the tire design and the road surface on which the tire is operated. Measurement of a tire's traction capabilities is indicative of the performance of the tire-road surface combination. Therefore, it is important that the surfaces used to evaluate tire traction capabilities react in a manner similar to those on which the tire will operate. This paper presents a method for categorizing road surface traction properties by evaluating the traction performance of road surfaces when tested with a series of special tires. Data are presented on a series of road surfaces and recommendations are made for traction test surface design.

Search terms: Wet road conditions; Pavement friction; Pavement skid resistance; Pavement surface texture; Pavement tests; Road surfaces; Asphalt pavements; Concrete pavements; Tire characteristics; Tire traction; Braking forces; Tire pavement interface; Tire tests

2/7 Meteorological Conditions

HS-010 090 Fld. 2/7; 2/4

DENT PROBLEM: BREAKING THROUGH

by M. Earl Campbell

Published in *Traffic Quarterly* v25 n2 p209-14 (Apr 1971)

The problem of wet pavement accidents, its causes, its magnitude, and its economic cost are considered in this article. West Virginia has treated 15 skid-prone sites in 1969 and the accident rate was reduced by half at the treated sites.

Search terms: Wet skidding; Pavement surface texture; Pavement skid resistance; West Virginia; Accident location; Wet road conditions; Equations

2/9 Traffic Control

HS-010 091 Fld. 2/9

AN INTRODUCTION TO TRAFFIC FLOW THEORY. CH. 5. SOME EXPERIMENTS AND APPLICATIONS

by R. S. Foote

Published in *Highway Research Board Special Report* n79 p119-36 (1964)

48 refs
Report no. IIRB-SR-79

The tools available for use in conducting traffic control experiments and measuring driver behavior in response to traffic events are described. Several traffic control theories have been applied to optimize traffic flow through such critical areas as tunnels and urban freeways. Maximum flow through bottlenecks is obtained by maintaining speed through the use of remote controlled traffic signs and signals. Completely automated flow control systems that will detect traffic interruption and apply corrective measures such as lane control and changeable speed signals are being considered. Closed-circuit television may be used as a monitoring device for such a system.

2/9 Traffic Control (Cont'd.)

HS-010 091 (Cont'd.)

in urban areas through the use of computerized traffic signal networks.

Search terms: Traffic flow; Driver reaction time; Driving simulation; Car following; Tunnel traffic flow; Platoons; Vehicle spacing; Continuous flow models; Traffic funnels; Photography; Vehicle detectors; Traffic data recorders; Freeways; Intersections; Remote controlled signals; Remote controlled signs; Electronic traffic control

AVAILABILITY: HRB

HS-010 092 Fld. 2/9

RESULTS OF OVERTAKING STUDY

by E. F. Mullen; M. Loth

[1970] 5p
Report no. IRRD-29263

Distances traveled by overtaking vehicles from the point of no return to completion of the movement are computed for cases where the vehicle being overtaken is going 10 mph below the 85th percentile speed of the road, and the overtaking vehicle is going either 60 or 50 mph. Vehicle separation immediately before and after the overtaking movement is two car lengths. Minimum sight distances for these maneuvers are also given.

Search terms: Overtaking; Sight distances; Australia; Vehicle spacing

HS-010 093 Fld. 2/9

REPEAT TRAFFIC STUDIES IN 1967 IN EIGHT TOWNS PREVIOUSLY SURVEYED IN 1963/4

by M. Marlow

1971 24p 1 ref
Report no. RRL-LR-390

A study was made in 1967 of journey speed and flows along all main roads within the administrative areas of eight towns of population ranging from 70,000 to one-half million. This survey was a repeat of part of a study made in 1963. Survey techniques are outlined and summaries presented of measurements made during the weekday off-peak and peak periods and on Saturday. The average daytime off-peak flow on primary routes in the towns was 1145 passenger car units per hour (pcu/h), while that in the peak was 1470 pcu/h. Associated with the 30% increase in flow during the peak was a 7% reduction in speed to about 30 km/h. Although the traffic flows for the central areas were similar to the above values, mean traffic speed was only 60% of whole network speed. A general decrease in street parking, particularly in town central areas, together with the introduction of traffic management schemes, helped to keep speeds relatively constant, with only a small decrease, despite rising flows, in the four-year period.

Search terms: Traffic surveys; Traffic data analysis; Urban traffic flow; Traffic volume; Speed volume relationships; On street parking; Speed patterns; Peak hour traffic; Day of week; Time of day; Central business districts; Truck equivalency

HS-010 094 Fld. 2/9

MERGING AND WEAVING OPERATIONS IN TRAFFIC

by D. W. Knox

Published in *Australian Road Research* v2 n2 p10-20 (Dec 1964)

12 refs

This paper describes studies of merging and weaving characteristics for motor cars and similar small vehicles operating under Australian conditions. Using a

made at two sites on the Cahill Expressway in Sydney. Automatic operation of the shutter on the 16 mm camera was obtained by the use of a solenoid and an electrical circuit. The rate of exposure used was one frame per second. Analysis of individual vehicles, shown in enlarged pictures, enabled the measurement of speed, lateral movement, gaps accepted, and time and length to complete a merge or weave. In the cases observed where a deliberate maneuver was made in entering a gap, significant correlation was obtained between the lengths of merges and the speeds of the merging cars. In the last section of the paper, accurate values of acceptable gaps are calculated for safe and moderate driving, expected for the majority of drivers in Australia.

Search terms: Merging; Weaving; Sydney; Time lapse photography; Gap acceptance; Speed; Time factors

HS-010 095 Fld. 2/9; 2/5

COLOR CODING ENTRY AND EXIT RAMPS

by Robert Dymant

Published in *Public Works* v93 n4 p128-30 (Apr 1962)

Experimental color coding with reflective material gave improved driver performance at a Minnesota cloverleaf interchange. Parts of entry ramps were treated with yellow reflective material to warn of merger into high-speed interstate lanes; lanes to exit ramps were reflective blue to warn of slowdown for exit ramps. Delineation markers were combined with reflectorized pavement to distinguish by color, brightness, and position, the location and design of exit and merging ramps. Five major experimental conditions were used over a seven-week period: overhead illumination; no reflectorization or illumination; interstate delineation; complete reflective treatment; and complete reflective treatment with overhead illumination. Higher differential speeds and more accurate placement of cars on

under better visibility conditions, with little effect on ramp and through-lane speeds. Driver interviews indicated better ability to identify the merging traffic areas after reflective treatment, and more use of cues from signs and markings than from vehicle flow.

Search terms: Color coding; Night visibility; Reflectorized pavement markings; Delineators (traffic); Cloverleaf interchanges; Driver performance

HS-010 096 Fld. 2/9; 4/7

AN ANALYSIS OF THE BOLTZMANN-TYPE STATISTICAL MODELS FOR MULTI-LANE TRAFFIC FLOW

by P. Munjal; J. Pahl

System Development Corp.; California Univ. ITTE

1968 32p 10 refs
Contract FH-11-6623
Report no. 69-3

Presented at 34th National Meeting, Operations Research Society of America, Philadelphia, 8 Nov 1968.

A fundamental problem in unidirectional traffic flow theory is the determination of the distribution of speeds as a function of concentration. One of the principal stochastic approaches involves concepts found in the kinetic theory of gases. However, there seems to be a great deal of controversy over the application of these concepts to the description of traffic flow on multi-lane highways. The Boltzmann-type statistical models for multi-lane traffic flow of Prigogine, et al. are critically reviewed. The basic and generalized Boltzmann-type equations for traffic flow have been derived with more emphasis on the physical meaning of the analytical derivations with respect to the traffic context. The mathematical foundation on which the relaxation, interaction, and adjustment processes are based has been evaluated in depth. The

and their ability to describe the vehicular traffic flow on multi-lane highways is discussed.

Search terms: Mathematical models; Mathematical analysis; Speed patterns; Stochastic traffic flow models; Traffic density; Traffic distribution models; Traffic volume; Equations; Traffic flow; Four lane highways; Six lane highways

3/0 HUMAN FACTORS

3/1 Alcohol

HS-010 097 Fld. 3/1

ZEROING IN ON DRUNK DRIVERS

Anonymous

Published in *Journal of American Insurance* v47 n3 p1-4 (May 1971)

The federal government has authorized a massive alcohol abuse control program in which the Department of Transportation and the Department of Health, Education and Welfare will coordinate preventive and treatment efforts. The new federal program will focus on four key areas: development of new techniques; public education; traditional safety programs; federally funded community programs.

Search terms: Safety campaigns; Alcohol education; Alcohol usage deterrents; Alcohol detection and interlock systems; Drinking drivers; Federal aid; Alcoholism; Driver intoxication; Problem drivers

HS-010 098 Fld. 3/1

THE ALCOHOL SAFETY COUNTERMEASURES PROGRAM: A PANACEA OR PANDORA'S BOX

Published in *Traffic Digest and Review* v19 n4 p16-24 (Apr 1971)

23 refs

In 1970 under the auspices of the Michigan Office of Highway Safety Planning and the National Highway Traffic Safety Administration, a survey was made of several communities to determine where it might be most feasible for the Michigan State Department of Public Health to implement a public health approach to rehabilitating drivers convicted of alcohol-related traffic offenses. The present paper presents a major portion of that survey report. Eleven recommendations are included, regarding the gathering of data, cooperation among agencies dealing with the problem of drinking drivers, development of facilities to treat such drivers, alcohol education.

Search terms: Drinking drivers; Alcohol laws; Alcoholism; Data acquisition; Surveys; Alcohol education; Police cooperation with other agencies; Alcohol usage deterrents; Driver rehabilitation; Problem drivers; Driver intoxication; Traffic court cooperation with other agencies; Traffic law enforcement

HS-010 099 Fld. 3/1

IDENTIFICATION OF PERSONALITY, ATTITUDINAL, AND BIOGRAPHICAL CHARACTERISTICS OF DRINKING DRIVERS

by M. W. Perrine

Published in *Behavioral Research In Highway Safety* v2 n4 p207-26 (Winter 1970)

4 refs
Contract FH-11-6609; FH-11-6899

Based on paper presented to American Psychological Assoc., Washington, D.C., 1969.

3/1 Alcohol (Cont'd.)**HS-010 099 (Cont'd.)**

alcohol and problem drinkers are involved in traffic crashes and citations are discussed. The specific aim is to compare respondents at selected points along the continuum of drivers in order to determine stable differences in psychological and biographical variables which will enable construction of a weighted psychometric index to improve advance identification of high-risk problem drinking drivers. In addition to driver attitude survey and Eysenck personality inventory data, interview and public record data were obtained for approximately 273 respondents in six samples: fatal and serious injury crash, driving-while-intoxicated and other serious moving citations, and clear-record. Of greatest salience as a group were the DWIs of whom there were: 97% males, 73% over 24 years, 18% without spouses, 50% laborers; and, having two or more of each traffic problem: 28% with crashes and 39% with prior citations in previous five years. They were also outstanding in high frequency and heavy quantity of reported consumption of liquor and especially beer.

Search terms: Drinking drivers; Driver attitudes; Problem drivers; Driver intoxication; Driver personality; Driver sex; Driver license suspension; High risk drivers; Driver age; Variance analysis; Beer; Driver characteristics; Driver identification; Male drivers; Driver records; Accident repeater drivers; Driver social class; Marital status; Alcohol usage; Psychometrics; Driver psychological tests

The connection between power and drinking ordinarily is benign. After all, it is safer to have occasional feelings of power than to spend your time trying to be bigger, stronger, and more important than others. But for a few, the connection between power concerns and drinking is disastrous. Those who are unusually concerned about personalized power cannot drink safely. Liquor for them accentuates power, which leads to even heavier drinking, fights, accidents, to all those personal-power actions that can destroy themselves and others. But for most of us, moderate drinking provides a safe, pleasant way to feel a little high (powerful) with our friends and, despite the warnings of prohibitionists, physiologists, psychologists and safety experts, a drink or two does not make us more likely to wreck our cars or slug our friends.

Search terms: Alcohol effects; Alcoholic beverages; Alcohol usage; Aggression; Attitudes; Behavior; Risk taking; Drinking drivers; Driver personality; Social drinking; Power; Psychological factors

3/2 Anthropomorphic Data**HS-010 101 Fld. 3/2****DRIVER EYE HEIGHT STUDY, 1969**

by G. M. Anderson

Published in *Australian Road Research* v4 n4 p9-14 (Jun 1970)

In this study, carried out February 1969, only passenger cars were considered, as most commercial vehicles have driver eye heights well above the design value. The mean eye height was found to be 47.2 inches and the 15th percentile eye height to be 44.2 inches. Measurements taken in

Search terms: Anthropometry; Australia; Sitting (body position); Eye location

HS-010 102 Fld. 3/2; 5/14**THE ANGLE OF SHOULDER SLOPE IN NORMAL MALES AS A FACTOR IN SHOULDER HARNESS DESIGN**

by Clyde C. Snow; A. Howard Hasbrook

Federal Aviation Agency

1965 6p 3 refs
Report no. AD-689 808; PB-169 175;
AM-65-14

This study was undertaken to provide information on the normal value of shoulder slope angles for use in shoulder harness design. The study data were from a random sample of 55 from some 500 somatotype photographs of male Air Traffic Service trainees. All subjects had passed a physical examination essentially equivalent to that given annually to commercial airline pilots. Mean age for the sample was 27.9 years, weight 161.8 pounds, and height 69.56 inches. Shoulder slopes were measured for both trapezial and deltoid segments; no significant differences existed. Differences between left and right trapezial angles probably are associated with handedness, but are negligible for shoulder-harness design. The mean shoulder slope angle from the vertical, based on weighted means of left and right trapezial segments, was 67.5 degrees, with a standard deviation of 5.0 degrees.

Search terms: Anthropometry; Shoulders; Shoulder harnesses; Males; Human body segment parameters; Human body size

AVAILABILITY: NTIS

Published in *Air Force Driver* v5 n1 p18-20, 26 (Jun 1971)

The Safety Laboratory Research Center in Peoria, Illinois, provides unique, interesting, and worthwhile safety training especially in bicycle safety to 60,000 elementary school children. The instruction is a required part of the grade school curriculum and certified teachers instruct. Children tested before and after a year's three sessions at the center have shown a 46% increase in retention of subject matter.

Search terms: Child safety education; Bicycle handling; Bicycle safety

3/4 Driver Behavior

HS-010 104 Fld. 3/4

AUDITORY DIFFERENCE LEVELS AS AN INHIBITOR OF DRIVER-MOTOR REFLEX TIME AND COGNITION

by Christine Elena Carlos

Hug (Proctor R.) High School

n.d. 21p 17 refs

The hypothesis of this research was that high intensity sound produced by car radios inhibits driver motor reflex time and cognition. The effect of intensities of different frequencies of pure sound on drivers was investigated. Subjects were all high school students and all had taken driver education classes. The effects of the combinations of intensities and frequencies on driver behavior were measured according to braking and steering errors preprogrammed on a "hazardous situations" film and compared to results obtained in a low intensity-low frequency environment. The intensity of sound did have an effect on driver motor reflex time and cognition. High intensities had the most significant effects, with one exception, while a combination of medium frequency and medium intensities had the least effect.

Search terms: Acoustic measurement; Noise tolerances; Driver behavior research; Sound intensity; Driver emergency responses; Music effect on drivers; Auditory perception; Hazards; Driver reaction time; Radio usage; Noise exposure; Attention lapses; Steering; Braking; Driver errors; Driver performance under stress; Driving simulation

HS-010 105 Fld. 3/4

HOW TO STEER CLEAR!

by E. D. Fales, Jr.

Published in *Popular Mechanics* p53-6, 162 (Jul 1971)

In order to survive a close call, one must drive like a racing car driver: that is with concentration and anticipation. Even the best driver can find himself in a situation not of his own making. The trick is to drive out of it. Some examples are given of emergency situations and the way to get out of them safely.

Search terms: Accident avoidance; Driver skills; Driver reaction time; Vehicle handling; Driver emergency responses

HS-010 106 Fld. 3/4; 5/14

SEAT BELTS, SAINTS AND FEAR

by Gordon W. Russell

Published in *Journal of Safety Research* v3 n2 p80-5 (Jun 1971)

12 refs

Portions of this paper were presented to the Montana Psychological Assoc., April 1969.

This study investigated relationships between concrete and symbolic risk avoidance behavior and fear associated with highway driving. Four groups of subjects

of the Knights of Columbus resulted in a four factor solution. The dimensions were identified as disability, hazardous terrain, irresponsible others, and the unexpected. The use of seat belts and dashboard statuettes was examined in terms of fear ratings on the major disability dimension. Levels of the seat belt factor differed significantly with fear ratings (higher with seat belts installed or used) and the seat belt x statuette—no statuette interaction was significant as well. An unexpected finding was low fear ratings in the "no statuette—seat belt installed but not used" group. Levels of the statuette factor with seat belt level were not significant. Statuette owners were significantly more trusting of their fellow motorists than non-owners. The results were viewed within the context of dissonance theory and a parallel was drawn with some of the results from smoking research.

Search terms: Fear; Driver attitudes; Seat belt usage; Driver motivation; Psychological factors; Driver characteristics; Anxiety; Driver behavior; Variance analysis; Religious symbol usage

3/5 Driver Education

HS-010 107 Fld. 3/5

TRAINED TEENAGE SCHOOL-BUS DRIVERS SAFER THAN ADULTS

by Gordon F. Ward

Published in *Safety Standards* v19 n3 p14-6, 28 (May-Jun 1970)

In September 1968, an amendment was issued to Hazardous Occupations Order No. 2 to permit 16 and 17-year-old persons to drive school buses upon approval of the Secretary of Labor. Governors of 15 states employing approximately 12,000 school bus drivers under age 18 applied for exemptions. A Bureau of Labor Standards study disclosed that the cumulative frequency of drivers 16 to 17 years old

3/5 Driver Education (Cont'd.)

HS-010 107 (Cont'd.)

worked, while for the drivers 18 and over, it was 1.8. Careful selection of these young drivers, excellent training programs, and proper controls being exercised by school and local authorities, are key factors.

Search terms: School bus drivers; Driver education; Age factor in driving; Driver records; Adolescent drivers; Adult drivers; Injury rates; Accident rates

HS-010 108 Fld. 3/5

THE SECOND CRISIS IN DRIVER EDUCATION WITH SUGGESTIONS FOR SOLUTION

by Kenneth F. Licht

Published in *Traffic Safety* v71 n9 p8-9, 38-9 (Sep 1971)

Driver education was the only state safety program element mandated by the Highway Safety Act of 1966. But it has been labeled an educational frill, challenged by researchers as ineffective, given lower Federal priorities than other safety measures, and has stopped growing, reaching only two-thirds of students eligible. The crisis is in financing, and the solution lies in better organization and use of paraprofessionals. Qualifications, duties, and salaries are suggested for instructional specialist, master teacher, staff teacher, instructional assistant (paraprofessional), and teacher-aide.

Search terms: Driver education; Driver education costs; High school driving courses; Financing; Manpower utilization; Instructors

3/6 Driver Licensing

HS-010 109 Fld. 3/6

A CLOSE LOOK AT DRIVER LICENSING

Published in *Traffic Safety* v71 n5 p16-18, 38-9 (May 1971)

A study of driver licensing and performance was undertaken by Spindletop Research for the National Highway Safety Bureau. The objectives were to conduct an extensive survey of the driver licensing, driver improvement, and driver record-keeping practices of the 50 states; to review and evaluate major published research relevant to driver licensing and performance, and recommend a research program which would lead to improved driver licensing programs; and to recommend an interim set of standards for state driver licensing until research findings become available. It was concluded that: there is little consistency in the driver licensing practices of the states, but that did not seem to affect accident rates; there is evidence that individuals with poor driving records can be expected to have more accidents than the average driver, but these poor drivers account for a small percentage of all accidents; there is evidence that personalized driver improvement clinics help improve the performance of poor drivers.

Search terms: Driver license laws; Driver licensing; Driver reexamination; Driver improvement; Driver improvement schools; Driver records; Driver characteristics; Accident rates; Driver license examination; State laws; Problem drivers

3/9 Impaired Drivers

HS-010 110 Fld. 3/9

DRIVING RECORD OF MEDICAL AND SURGICAL PATIENTS

by Matthew W. Buttiglieri; Marie Guennette; Mae Thomson

Published in *Perceptual and Motor Skills* v29 p427-34 (1969)

11 refs

The purpose of this study was to

surgical patients and how these relate to the driving records of comparison groups. Records of accidents and driving violations for three years prior to hospitalization were obtained for 798 medical-surgical patients with active driver licenses. Results indicate that the accident involvement of medical-surgical patients is not significantly different from that of psychiatric patients or from that of a large random sample of male California drivers. With respect to driving violations, both patient groups had a significantly higher record of violations than the comparison group. High-accident involvement was associated with genitourinary and respiratory disorders. The findings strongly suggest that accident risk may almost triple as the severity of medical-surgical symptoms increases to the point requiring hospitalization.

Search terms: Medical factor caused accidents; Mental disorders; Driver mental fitness; Driver records; Traffic law violations; Accident records; Male drivers; Driver physical fitness

3/11 Pedestrians

HS-010 111 Fld. 3/11

PEDESTRIAN SAFETY. REPORT TO THE ROAD SAFETY COMMITTEE ON THE ENGINEERING INSTITUTE OF CANADA ON PROJECT EM-8

by Barry S. Marrus

Kates, Peat, Marwick and Co.

1968 39p 21 refs

The object of this report is to provide guidelines and suggestions which will lead to the improvement of pedestrian safety. A statistical analysis of pedestrian accidents is given. Recommendations are that pedestrian safety can be improved with: traffic engineering and city planning, legislation and enforcement, and

Search terms: Pedestrian accidents; Pedestrian age; Pedestrian behavior; Pedestrian control; Pedestrian crossings; Pedestrian fatalities; Pedestrian injuries; Statistical analysis; Pedestrian safety; Turning; Pedestrian vehicle interface

HS-010 112 Fld. 3/11; 1/5

A LITERATURE REVIEW AND BIBLIOGRAPHY OF RESEARCH AND PRACTICE IN PEDESTRIAN SAFETY

by Linda Shapiro; Rudolf G. Mortimer

Michigan Univ. Hwy. Safety Res. Inst.

1969 61p 156 refs
Report no. HSRI-HuF-3

A review of literature dealing with pedestrian safety yields two basic types of information: statistical descriptions of accident victims and theories covering human factors in the causes of accidents; and various methods of accident prevention, from the points of view of safety education, law enforcement, and traffic engineering. The articles read, published between 1941 and 1968, are mainly from periodicals and technical journals. The statistical analyses of accident victims concentrate on three main groups—young (school) children, elderly adults, and middle-aged adults under the influence of alcohol. Probable factors contributing to accidents in these groups are discussed. Articles on the pedestrian hazards associated with night and winter driving and other environmental effects are also discussed. Devices for accident prevention applicable to specific groups are described, as well as town safety campaigns, town engineering plans, and intersection control. Fixing the responsibility for accidents is discussed.

Search terms: Accident responsibility; Jaywalking; Reviews; Pedestrian accidents; Pedestrian safety; Pedestrian behavior; Alcohol usage; Age factor in accidents; Child safety education;

pedestrians; Aged pedestrians; Pedestrian visibility; Pedestrian injuries; Pedestrian fatalities; Intersections; Pedestrian crossings

3/12 Vision

HS-010 113 Fld. 3/12; 2/5; 5/10

VISION AT LEVELS OF NIGHT ROAD ILLUMINATION: LITERATURE 1967-1969

by Oscar W. Richards

Published in *Highway Research Record* n336 p63-75 (1970)

196 refs

This paper reviews published research (mostly in English) during the period covered. General sources are given for broad topics within the subject area and specific research findings are noted.

Search terms: Night driving; Night visibility; Night vision; Headlamps; Driver vision standards; Vision tests; Glare; Reduced visibility; Reviews; Vehicle lighting; Highway lighting; Street lighting; Color perception

4/0 OTHER SAFETY-RELATED AREAS

4/1 Codes and Laws

HS-010 114 Fld. 4/1; 3/1

KNOW THE LAW. INTERPRETATION OF IMPLIED CONSENT LAWS BY THE COURTS. PT. 1

by Robert H. Reeder

Published in *Traffic Digest and Review* v19 n3 p14-21 (Mar 1971)

37 refs

All but four states have enacted implied consent laws. Basically, the pattern of

vehicle upon a public highway shall be deemed to have given consent to a chemical test or tests of his blood, breath, or urine for the purpose of determining the alcoholic content of his blood. The person can refuse to have the tests, but his license is revoked until a hearing. If the revocation is sustained after the hearing, the person has the right to file an appeal in a court of law. A number of legal questions and the changes made by the various states in the basic patterns outlined above are discussed. The question of the constitutionality of the implied consent law as to self-incrimination is raised.

Search terms: Implied consent laws; Alcohol laws; Alcohol blood tests; Alcohol breath tests; Constitutional law; Court decisions; Driver license revocation; Self incrimination; Legal rights; Alcohol test refusal; Drinking driver evidence

HS-010 115 Fld. 4/1; 3/1

KNOW THE LAW. INTERPRETATION OF IMPLIED CONSENT LAWS BY THE COURTS. PT. 2

by Robert H. Reeder

Published in *Traffic Digest and Review* v19 n5 p6-13 (Apr 1971)

41 refs

The question of the constitutionality of implied consent laws as to self-incrimination is discussed. The conclusion is that state supreme and appellate courts have consistently held that the implied consent law does not violate either the privilege against self-incrimination of the Fifth Amendment or the provisions on self-incrimination of the state constitutions. Other constitutional law questions which have been raised in cases challenging the implied consent law are discussed: search and seizure; due process of law; equal protection of the

AREAS

4/1 Codes and Laws (Cont'd.)

HS-010 115 (Cont'd.)

Search terms: Implied consent laws; Alcohol laws; Self incrimination; Constitutional law; Court decisions; Legal rights; Search and seizure; Due process of law; Equality before the law; Drinking driver evidence; Alcohol blood tests; Blood alcohol levels; Drinking drivers; Driver intoxication; Alcohol test refusal

HS-010 116 Fld. 4/1; 3/1

KNOW THE LAW. INTERPRETATION OF IMPLIED CONSENT LAWS BY THE COURTS, PT. 3

by Robert H. Reeder

Published in *Traffic Digest and Review* v19 n6 p16-24 (Jun 1971)

37 refs

A constitutional question which has been raised in cases challenging the implied consent law is the right to counsel. Conclusions are that the implied consent law does not violate the privilege against self-incrimination, nor is an unreasonable search and seizure involved, and it meets the requirements of due process of law. It is not a bill of attainder or an ex post facto law, nor does the implied consent law breach the equal protection clause. It does not violate the separation of powers doctrine nor freedom of speech. The purpose and benefits of the implied consent law are discussed.

Search terms: Implied consent laws; Constitutional law; Court decisions; Self incrimination; Search and seizure; Due process of law; Equality before the law; Drinking drivers; Drinking driver evidence; Alcohol test refusal; Driver intoxication; Alcohol blood

4/2 Community Support

HS-010 117 Fld. 4/2; 2/0

A CALL FOR COMMUNITY ACTION

by Roman L. Hruska

Published in *Journal of American Insurance* v46 n4 p8-9 (Sep-Oct 1970)

A united effort of government, civic and religious organizations, business, labor, agriculture, and the general public is needed to develop safe streets and highways, safer and properly repaired motor vehicles, and safer and self-disciplined drivers. The standards formulated by the Department of Transportation in 16 basic areas of safety are listed, and suggestions for actions to be taken by the ordinary citizen are given.

Search terms: Highway safety; Traffic laws; Community support; Safety standards; Highway safety programs

4/3 Cost Effectiveness

HS-010 118 Fld. 4/3; 5/14

A BENEFIT-COST ANALYSIS OF AUTO SAFETY FEATURES

by Lester B. Lave; Warren E. Weber

Published in *Applied Economics* v2 n4 p265-75 (1970)

20 refs

Sponsored, in part, by a grant from the National Safety Council.

After characterizing the pattern of injuries and fatalities in automobile accidents, those prevented by each of four safety devices: padded instrument panels, seat belts, energy absorbing steering columns, and dual braking systems, are translated into dollar benefits, based on the individual's demand curve for reduced probability of injury or death. Some prob-

effectiveness and costs, redundancy of protection offered by different devices, and possibly greater risk taking with safety devices. Seat belts appear to be a better buy than dual brakes, padded instrument panels, or collapsible steering columns.

Search terms: Benefit cost analysis; Safety device costs; Safety device effectiveness; Safety economics; Accident costs; Injury costs; Mathematical analysis; Seat belts; Energy absorbing instrument panels; Energy absorbing steering columns; Dual brakes

4/6 Insurance

HS-010 119 Fld. 4/6

SO YOU HAVE AN AUTO INSURANCE COMPLAINT

Anonymous

Published in *Journal of American Insurance* v47 n3 p5-8 (May-Jun 1971)

The main causes of auto insurance complaints are: (1) policy not renewed; (2) cancellation; (3) difficulty in getting insurance; (4) complaints on claims; and (5) cost of insurance. In buying insurance, select the agent and policy carefully, use deductibles to reduce costs, but buy adequate medical and financial responsibility coverage.

Search terms: Consumer complaints; Collision insurance; Financial responsibility; Insurance; Insurance cancellations; Insurance claims; Insurance rates; Liability insurance; Insurance denial

HS-010 120 Fld. 4/6; 5/11

INSURANCE AND CAR REPAIRS

by Colin Dryden

Published in *Motor Industry* v90 n960 p20-2 (Apr 1971)

pockets. The Motor Industry Repair Research Center was set up at Thatcham, Berkshire, Great Britain, late in 1969, for the express purpose of controlling the cost and improving the standard of vehicle repair work. The cost of the center was borne by a levy from the ultimate beneficiaries of its work—the British Insurance Association and members of Lloyds. The center works only on total losses. Lloyds has set up two motor damage assessing centers in London. The Lloyds policy owner takes his car to the center for an on-the-spot assessment of the damage. The center has eight recommended repairers, and the policy owner is given the name of the most suitable. The selected repairers contract to work for the price assessed by the center. The policy owner can choose another garage, but in 95% of the cases he does not.

Search terms: Automobile repair costs; Repair industry; Insurance industry; Damage costs; Great Britain; Damage claims; Damage estimation; Damage severity

4/8 Transportation Systems

HS-010 121 Fld. 4/8; 2/4

METHODS OF REDUCING AMENITY LOSSES CAUSED BY TRAFFIC—ROADS

by Oliver Cox

Cox (Shankland) and Associates

7 refs

Paper on Theme 5 of Tenth International Study Week in Traffic and Safety Engineering, Rotterdam, 7-11 Sep 1970. Other themes published in HS-009 315.

Urban roads can contribute gains to the surrounding community as well as to the road user. Integration of improved traffic engineering techniques, traffic control devices, and other measures can

environmental goals, functions and placement of the road network; it starts with people and activities and uses traffic to serve them. The community must be consulted and satisfied. At the urban design level, the road's form is related to adjacent land uses and protection from noise and pollution. At the detailed design level, the first opportunity for gain is use of soft landscaping. Pedestrian routes need to be direct and attractive. Elevated roadways have massive scale and their design and that of nearby buildings must harmonize.

Search terms: Urban planning; Urban highways; Environmental planning; Transportation planning; Highway planning; Liverpool; England; Traffic management

HS-010 122 Fld. 4/8; 5/6

METHODS OF REDUCING AMENITY LOSSES CAUSED BY TRAFFIC—VEHICLES

by K. Burow

Technische Univ., Berlin (West Germany)

1970 4 refs

Paper on Theme 5 of Tenth International Study Week in Traffic and Safety Engineering, Rotterdam, 7-11 Sep 1970. Other themes published in HS-009 315.

Almost universal car ownership leads to more use of leisure and free mobility but creates problems of traffic noise, noxious emissions, and accidents. Permissible workplace concentrations of emissions have been suggested as carbon monoxide 50 ppm, hydrocarbons 50 to 500 ppm, and nitric oxide 5 ppm. Soviet researchers suggest that lead causes metabolic disturbances and inflammation of intestines and nerves. They recommend limiting lead concentrations to 0.0002-0.0003 mg²/m³. Effects of

can be reduced by suitable air/fuel mixtures, afterburners, and recirculation, but odors may be increased. Though it can affect driver performance, noise seems of small public concern. Means of reducing noise are given.

Search terms: Exhaust emissions; Exhaust emission control; Carbon dioxide; Carbon monoxide; Nitric oxide; Hydrocarbons; Lead; Air quality standards; Air pollution effects; Vehicle noise; Noise control; Occupant protection; Europe; Aldehydes; Traffic noise; Exhaust odors; Noise tolerances; Vehicle air pollution

5/0 VEHICLE SAFETY

5/1 Brake Systems

HS-010 123 Fld. 5/1; 4/7; 5/18

THE DYNAMICS OF VEHICLES DURING BRAKING

by J. R. Ellis

Published in *Symposium on Control of Vehicles During Braking and Cornering*, London, 1963 p20-9

13 refs

Presented at Symposium on Control of Vehicles during Braking and Cornering, Jun 1963.

A mathematical model of a vehicle has been developed which can describe any combination of braking, acceleration, or steering, and will describe time histories of forward lateral and rotational velocities. From these velocities, the displacements along and perpendicular to the original heading direction may be calculated. To demonstrate the application of the equations a typical passenger car and an articulated commercial vehicle are described. The vehicles are first seen in a steady state turn at speed, and the effects produced by the application of brakes, steering, and so on, are shown.

5/1 Brake Systems (Cont'd.)

HS-010 123 (Cont'd.)

braking effort combined with a degree of directional control apply pulses of retarding force. Simulation of this form of braking is possible and some results of this simulation are shown.

Search terms: Acceleration; Braking; Mathematical models; Vehicle dynamics; Equations; Computerized simulation; Articulated vehicle performance; Automobile performance; Automobile modeling; Tire side forces; Tire slip motion; Articulated vehicle modeling; Pulsed braking; Vehicle control; Steady state; Turning

5/2 Buses, School Buses, and Multipurpose Passenger Vehicles

HS-010 124 Fld. 5/2

HOW SAFE IS PUPIL TRANSPORTATION?

by Seymour Charles; Annemarie Shellen

Published in *Pediatrics* v45 p165-87 (Jan 1970)

Evidence discloses that school bus accepted safety features and practices are largely being ignored. Drivers are not selected, trained, or supervised in accordance with any uniform guidelines. Four states do not require medical examination. Seventeen states allow school bus drivers to be only 16, and 35 states set no maximum age limits. Majority of states have no bus driver education program. Research on occupant protection has not been implemented. Drivers should wear seat belts as should all passengers. Children should not stand, adult supervision is needed, and there is a need for Federal safety standards.

Search terms: School bus safety; School buses; School bus drivers;

Driver age; Driver education; Driver physical examinations; Program evaluation; Safety education; Seat belts; Bus design; Occupant protection; Fire extinguishers; Speed limits; Color; Safety laws

5/4 Design

HS-010 125 Fld. 5/4

THE PRACTICAL PERFORMANCE OF AN AUTOMOBILE TYPE HOOKE'S JOINT

by A. J. Bartley

Published in *Institution of Mechanical Engineers Proceedings* i1969-70 v184 pt2A n14 p295-314

5 refs

Despite their wide usage little is known about the practical velocity transmission characteristics of needle bearing type Hooke's joints, and it is usually assumed that they obey elementary theory even though such theory is purely geometrical in character and consequently ignores speed effects, load effects, friction effects, and so on. This paper gives details of equipment used to investigate the static and dynamic behavior of a typical automobile type Hooke's joint and reports on the results obtained. The static behavior was found to be in excellent agreement with simple theory, while the dynamic tests showed that the joint performance was virtually unaffected by the torque transmitted. Resonant effects were observed at certain speeds, however, and in these circumstances the joint behavior is largely determined by the amount of damping present in the driving system.

Search terms: Joints; Dynamic tests; Static tests; Damping; Torque; Torsional vibration; Performance tests; Test equipment; Oscillation

HS-010 126 Fld. 5/4

WHAT IS NEW IN AUTOMOTIVE HEADLINERS?

by Ray W. Westrick; James W. Grcig

Woodall Industries, Inc.

1971 5p

Report no. SAE-710068

Presented at Automotive Engineering Congress, Detroit, 11-15 Jan 1971.

This paper describes the development of a process that will mold a urethane resin in the form of a laminate. The urethane resin is a most unusual material: it can be formulated to produce thermosetting foam of almost any density, and the formulation can also be made to produce either a flexible or rigid foam. It has excellent adhesive properties, which have been used to make the laminate. The process produces a laminate of two skins, which are combined with a film of urethane resin in its liquid form. This combination, when placed in a heated mold, causes the resin to expand until both skins reach the confine of the mold. This then cures to the shape of the mold and the texture of its surface, making it possible to mold sculptured and formed shapes or panels, which can be used for interior trim for automobiles.

Search terms: Urethanes; Thermosetting resins; Polyurethane foams; Headliners; Laminates; Plastic foams; Materials tests; Trim

AVAILABILITY: SAE

HS-010 127 Fld. 5/4

THE GROWTH OF PLASTICS IN THE U.S. AUTOMOBILE

by Otto W. Vathke

Published in *Automotive Engineering* v79 n6 p18-32 (Jun 1971)

Plastics usage in automobiles is a rapidly growing part of total plastics production.

The jump from 20 pounds per car in 1960 to 100 pounds by 1970 was paralleled by similar growth in other parts of the world. Factors in the increased use of plastics include reduced costs; good engineering design; new materials development; improved processes; good quality control; government safety regulations; usefulness in air pollution control devices; long-term reliability. Plastic uses in engines, transmissions, and bodies are outlined.

Search terms: Plastics; Nylon; Engine design; Body design; Transmissions; Service life; Exhaust emission control devices; Automotive parts

HS-010 128 Fld. 5/4

INDUCTION HARDENING MAKES EXHAUST-VALVE SEATS WEAR LESS WITH NON-LEADED FUEL

by William Giles

Published in *Automotive Engineering* v79 n6 p33-7 (Jun 1971)

3 refs

Excessive wear of exhaust valves and seats commonly accompanies operation with unleaded gasoline, but induction hardening appears to be a low cost solution to the problem. Valve durability is good with leaded gasoline as well. Various valve coatings have been tried, but seem to be less durable. The wear mechanism is discussed as it affects valve design.

Search terms: Hardening; Leaded gasoline; Lead free gasoline; Exhaust valves; Exhaust valve wear; Wear tests; Pitting; Engine operating conditions

HS-010 129 Fld. 5/4

HOT FACTS ON THOSE "COOL" RADIATOR ADDITIVES

Published in *Popular Science* v198 n6 p38, 40, 42, 108 (Jun 1971)

Manufacturers of summer coolants claim that their radiator additives advantageously replace anti-freeze/coolants. Radiator additives were tested and found to be vastly overrated. The automotive industry says their use is not recommended.

Search terms: Cooling system additives; Coolants; Cooling systems; Heat transfer; Foaming; Boiling points; Glycols; Surfactants; Automobile maintenance

HS-010 130 Fld. 5/4

ANTI-SPIN DEVICE FOR '71

Anonymous

Published in *Automotive Industries* v143 n7 p33-6 (1 Oct 1970)

New features of the 1971 model Buick automobile are described: antiskid device, improved steering and suspension, and new chassis. The engines are all designed to operate on unleaded gasoline and come equipped with an evaporative emission control system. Improved serviceability is also a feature.

Search terms: Automobile models; Engine design; Evaporative emission control devices; Antiskid devices; Steering system design; Suspension systems; Chassis design; Buicks

HS-010 131 Fld. 5/4

THE INTERNATIONAL HARVESTER NEW 300/400 DIESEL ENGINES

by J.C. Basiletti; G.J. Maat; E.F. Petrak; W.A. Wallace

International Harvester Co.

Presented at SAE mid-year meeting, Montreal, 7-11 Jun 1971.

A new series of heavy duty diesel engines has been developed by the Construction Equipment Division of the International Harvester Company. Nine engines are the result of two basic engine series, the 300 and 400. The engines have been designed for commonality of parts and for economical high volume tooling. This paper deals with some of the aspects of the development, testing, and application of the engines.

Search terms: Diesel engines; Engine design; Crankcases; Stress analysis; Oil lines; Crankshafts; Rods; Fuel injection; Pistons; Piston rings; Gears; Engine performance; Turbocharging; Diesel engine exhaust emissions; Cold starts; Cylinder heads; Valves; Combustion chamber swirl

AVAILABILITY: SAE

HS-010 132 Fld. 5/4; 4/5

ELECTRONIC EQUIPMENT FOR MEASURING MOTOR VEHICLE PERFORMANCES ON THE ROAD

by G. L. Ardoino; F. Pinolini; L. Zandona

Published in *Instrumentation and Test Techniques for Motor Vehicles*, London, 1967 p11-20

Report no. Paper-14

Presented at a symposium jointly sponsored by the Institution of Mechanical Engineers and the Advanced School of Automobile Engineering, Cranfield, England, 4-5 Jul 1967.

Equipment using transistorized modular circuits has been in use for some years at Fiat to measure performance. Equipment in the vehicle, on the ground, or both, measures vehicle speed, engine speed, and fuel consumption as instantaneous or average values. Operation and circuit diagrams are illustrated. Magnetic

5/4 Design (Cont'd.)

HS-010 132 (Cont'd.)

produced by the equipment, which permits accurate and rapid testing.

Search terms: Test equipment; Instrumented vehicles; Road tests; Stopping distances; Braking; Vehicle performance; Computerized test methods; Fuel consumption; Proving ground tests; Engine speeds; Speed sensors; Acceleration; Electronic devices

5/6 Fuel Systems

HS-010 133 Fld. 5/6

AIR POLLUTION CONTROL— GETTING INTO GEAR

by John T. Middleton

Department of Health, Education and Welfare

1971 \$p

Report no. SAE-710060

Presented at Automotive Engineering Congress, Detroit, 11-15 Jan 1971.

This paper outlines the provisions of the 1970 Clean Air Act and the steps that must be taken by the federal government, state and local governments, industry and the public to implement its provisions. The basis of the standards to be issued under the act is the need to protect the public health and welfare. The need to attain them will either force the use of available technology or create new pressures for the discovery and demonstration of new methods to control air pollution. The federal government will set the goals; it will be up to the state and local administration, planners, and technicians to find ways to meet them. The effect of this at all levels of government is outlined. The automobile is the source of about half of the air pollution in the United States. Therefore, the automobile is the principal

well press the internal combustion engine to its design limits and require new approaches by industry and its engineers.

Search terms: Air quality standards; Government industry cooperation; Vehicle air pollution; Air pollution control; Air pollution laws; Air pollution emission factors; Community support; Clean Air Act of 1970

AVAILABILITY: SAE

HS-010 134 Fld. 5/6

THE CAR OWNER'S ADVOCATE. GASOLINE ADDITIVES

by John Ehrridge

Published in *Road Test* v7 n8 p70-3 (Jun 1971)

Various additives used in gasolines include antioxidants, solvents, detergents, antirust compounds, lead, and combustion deposit modifiers. The problems involved in operating engines with lead free versus leaded gasoline are discussed.

Search terms: Fuel additives; Antioxidants; Tetraethyl lead; Engine deposits; Leaded gasoline; Lead free gasoline; Gasoline stability; Gasoline quality; Engine operating conditions; Lead; Solvents; Detergents; Rustproofing

HS-010 135 Fld. 5/6

AIR POLLUTION AND THE MOTOR VEHICLE—WHAT NEXT?

by D. R. Russell

Published in *Petroleum Review* p103-13 (Mar 1971)

59 refs

Pollution from gasoline-engined motor vehicles can be reduced to very low

remain the principal prime mover well into the next decade. Retaining low emissions on used cars is a major problem because of poor maintenance. Low-emission propulsion systems include electric and turbine engines, both entailing severe problems. The background of pollution control, legislative situations in various countries, and the high costs of further emission reductions are discussed.

Search terms: Air pollution control; Air pollution emission factors; Vehicle air pollution; Carbon monoxide; Nitrogen oxides; Hydrocarbons; Particulate air pollutants; Exhaust emissions; Emission control; Air pollution laws; Air pollution control costs; Vehicle maintenance; Exhaust manifold reactors; Catalysts; Electric vehicles; Gas turbine engines; International factors; Fuel quality

HS-010 136 Fld. 5/6

ATMOSPHERIC POLLUTION FROM PETROL AND DIESEL ENGINEED VEHICLES

by D. R. Russell

Published in *Petroleum Review* p192-202 (Jul 1970)

52 refs

The relationship of gasoline engines and smog is discussed. The principal pollutants are carbon monoxide, unburned hydrocarbons, oxides of nitrogen, and lead. Aspects of the problem discussed are legislative controls, both in the United States and Europe; the sources of pollutants within the vehicle; the influence of mechanical and operation condition and of fuel composition on pollutants; and methods of preventing or controlling pollution. The problem in diesel engines pertains especially to smoke and odors.

Search terms: Odors; Smog; Vehicle air pollution; Air pollutants; Carbon monoxide; Hydrocarbons; Nitrogen

Engine operating conditions; Smoke; Air fuel ratio; Emission standards; Emission control; Air pollution laws; Europe; United States; Great Britain; Diesel engine exhaust emissions; Air pollution emission factors

HS-010 137 Fld. 5/6

HIGH PERFORMANCE WITH LOW EMISSIONS

by Tony Grey

Published in *Motor Age* v90 n5 p60-3 (May 1971)

Performance can be increased 25% to 50% without raising emission levels. Often emissions can be reduced if good tuneup equipment is carefully used. Basic engine condition must be good. The effects of engine modifications on emission levels are discussed. Testing and tuning of engines are described.

Search terms: High powered engines; Engine modification; Engine performance; Engine operating conditions; Tuneup; Exhaust emission control; Automobile maintenance; Engine tests

HS-010 138 Fld. 5/6

ESTIMATION OF EXHAUST HYDROCARBON EMISSIONS FROM MOTOR VEHICLES ACCORDING TO ENGINE SIZE

California Dept. of Public Health

1967 20p 11 refs

Data on exhaust hydrocarbon emissions are summarized by automobile size. Hydrocarbon concentrations, exhaust flow rates, and the California distribution of car population by engine size and transmission type are included. Results are summarized by class of vehicle and adjusted for driving cycle, transmission type, and cold starting.

Search terms: Engine size effect on exhaust; Exhaust emission tests; Vehi-

cle air pollution; Hydrocarbons; Exhaust densities; Vehicle size; Compact automobiles; Dynamometers; California; Exhaust emissions measurement; Air pollution emission factors; Transmissions; Coldstarts; Infrared analyzers; Flame ionization detectors

HS-010 139 Fld. 5/6

WHAT YOU SHOULD KNOW ABOUT THE NEW SUPER OILS FOR YOUR CAR

by Ray Potter

Published in *Popular Science* v198 n6 p45-7 (Jun 1971)

If your car is equipped with air conditioning and an automatic transmission, and is driven long distances at sustained high speed during the summer months, chances are that the best oil you could buy last year is not good enough anymore. The answer to this problem: the new SE (Service Extreme) oils. SE oils have increased high temperature resistance.

Search terms: Oils; Engine operating conditions; High speed; Engine speeds; High temperature; Heat tolerances; Engine deposits; Overheating

HS-010 140 Fld. 5/6; 5/11

THINK EXHAUST SYSTEMS

by Arthur A. Ingoglia

Published in *Motor Service* p36-9 (Jun 1971)

This article is intended for service shop operators. It describes the machinery and tools needed to replace exhaust systems and the procedures used to repair them. Problems common in the exhaust systems of Mercury Cougars and 1971 Cadillacs are particularly considered.

Search terms: Exhaust systems; Exhaust system failures; Repair industry;

Repairing; Automobile maintenance; Spare parts; Tools; Mercury Cougars; Cadillacs

HS-010 141 Fld. 5/6; 5/12

A STATEMENT OF GENERAL MOTORS CORPORATION TO THE ENVIRONMENTAL PROTECTION AGENCY ON THE CLEAN AIR AMENDMENTS OF 1970, WASHINGTON, D.C., MAY 7, 1971

by Edward N. Cole

General Motors Corp.

1971 11p

Stringent requirements for reduced pollution on 1975 and 1976 models will be extremely difficult to meet. Alternative power plants have not been proven, so improvements must continue on gasoline internal combustion engines. Improved carburetion or fuel injection, exhaust recirculation, catalytic and thermal reactors are under study. Lead-free gasoline is required for catalysts; special fuels and preheating may be necessary during warmup. Control of NO_x is most critical and incompatible with control of HC and CO emissions. Manufacturers will emphasize greater durability, especially on components affecting emissions, and will work hard to meet the new requirements.

Search terms: Air pollution control; Vehicle air pollution; Exhaust emission control; Exhaust emission control devices; Hydrocarbons; Carbon monoxide; Nitrogen oxides; Clean Air Act of 1970; General Motors Corp.; Catalytic converters; Exhaust gas recirculation; Engine heaters

5/9 Inspection

HS-010 142 Fld. 5/9; 4/2

PERIODIC MOTOR VEHICLE INSPECTION

by James E. McKelvey

HS-010 142 (Cont'd.)

Published in *Motor Service* p30-2 (Jun 1971)

The National Highway Traffic Safety Administration made a study of how each state has performed in carrying out the dictates of the Highway Safety Act of 1966. Despite pressure being exerted, enactment of periodic motor vehicle inspection laws continues to be slow. The states are also slow in bringing into existence good laws in other areas of safety, and, where the laws exist, enforcement is often weak. To give the states their due, most of them have made good progress toward getting the drunk driver off the road. Included in this article is a "report card" with the fifty states and how they grade on seven standards that directly relate to vehicles and their safety.

Search terms: Highway Safety Act of 1966; Safety laws; Inspection laws; Vehicle registration; Motorcycle safety; Driver education laws; Driver license laws; Alcohol laws; State laws; Vehicle laws; Vehicle inspection

HS-010 143 Fld. 5/9; 5/20

THE COMPULSORY INSPECTION OF GOODS VEHICLES IN GREAT BRITAIN

by C. C. Toyne

Published in *Technical Aspects of Road Safety* n35 p3.1-3.26 (Sep 1968)

Truck and trailer inspection on a random basis had been done since 1934, but only a small proportion of vehicles were examined and the extent of poor maintenance found was disquieting. Compulsory inspection was to begin 1 October 1968, with 67 main testing stations and 24 auxiliary stations. Program operation, inspection procedures and documentation, and details of equipment and layout are described.

Truck defects; inspection fees; inspection procedures; Inspection stations; Vehicle weight limits; Great Britain; Truck maintenance

5/11 Maintenance and Repairs

HS-010 144 Fld. 5/11

GUIDELINES FOR ENGINE MAINTENANCE—ANALYSIS, REPAIRS, OVERHAULS, REBUILDING

Society of Automotive Engineers, Inc.

1969 26p 5 refs
Report no. SAE-SP-349

Includes HS-010 145; HS-010 146; HS-010 147; HS-010 148.

Four reports are presented on the subjects of engine performance analysis with modern instrumentation, failure causes, and abrasive wear, as well as a discussion on rebuilt engines and when to install them.

Search terms: Preventive maintenance; Engine wear; Abrasives; Vehicle maintenance; Engine failures; Internal combustion engines; Repairing; Engine performance; Rebuilt engines

AVAILABILITY: SAE

HS-010 145 Fld. 5/11

ENGINE PERFORMANCE ANALYSIS WITH MODERN INSTRUMENTATION AS RELATED TO VEHICLE MAINTENANCE

by N. E. Cafarelli; R. J. Zanic

Sun Electric Corp.

Published in HS-010 144, *Guidelines for Engine Maintenance—Analysis, Repairs, Overhauls, Rebuilding* (SP-349), New York, 1969 p1-5

Report no. SAE-690542

Survey made concerning modern test equipment as it is related to various fleet PM programs in the Chicago area. The survey explains how a profitable and satisfying fleet operation is made possible, from a maintenance standpoint, through the utilization of modern electronic test equipment and proper test procedures. Included are the areas of testing, types of test equipment needed, and fleet shop maintenance procedures.

Search terms: Engine performance; Preventive maintenance; Vehicle maintenance; Performance tests; Fleet management; Test equipment; Electronic devices

HS-010 146 Fld. 5/11

ENGINE FAILURE FINGER-PRINTS

by N. J. Musil

TRW, Inc.

Published in HS-010 144, *Guidelines for Engine Maintenance—Analysis, Repairs, Overhauls, Rebuilding* (SP-349), New York, 1969 p1-14

2 refs
Report no. SAE-690543

In this paper the author points out the importance of diagnosing failures to prevent a recurrence. Emphasis is placed on looking for the tell-tail markings and clues that will aid in tracing the cause of various engine parts failures; also, on the inspection of used parts and the selection of new parts. It is also pointed out that the selection of premium replacement parts may be necessary under certain operating conditions.

Search terms: Engine failures; Rocker arms; Valves; Pistons; Bearings; Preventive maintenance; Engine inspection; Hydraulic valve lifters; Mechanical valve lifters; Push rods; Oil pumps; Lubrication

HS-010 147 Fld. 5/11**ABRASIVE WEAR—IDENTIFICATION AND PREVENTION**

by James F. Kolbe

Sealed Power Corp.

Published in HS-010 144, *Guidelines for Engine Maintenance—Analysis, Repairs, Overhauls, Rebuilding* (SP-349), New York, 1969 p15-9

3 refs

Report no. SAE-690544

Abrasives wear, pertaining to the internal combustion engine, has been the subject of numerous technical investigations, papers, and articles. The majority of these presentations are in the area of filtration and the prevention of excessive or abnormal wear. Maintenance men must learn to determine if abrasive wear is present and then take corrective measures. This paper is intended to aid mechanics in identifying abrasive wear from a practical standpoint and in applying the proper remedy.

Search terms: Engine wear; Abrasives; Preventive maintenance; Abrasion

HS-010 148 Fld. 5/11**THE REBUILT ENGINE**

by H. W. Fellberg

Triangle Engine Rebuilders, Inc.

Published in HS-010 144, *Guidelines for Engine Maintenance—Analysis, Repairs, Overhauls, Rebuilding* (SP-349), New York, 1969 p20-4

Report no. SAE-690545

This paper discusses in detail the recommended procedures for rebuilding internal combustion engines: explains how

and describes how each part of the engine is examined, cleaned and tested to insure maximum performance. When an engine should be rebuilt, what rebuilding entails, how to evaluate a repair shop by its equipment, and similar valuable information regarding engines and their maintenance are topics considered.

Search terms: Internal combustion engines; Repairing; Automotive parts; Rebuilt engines; Crankshafts; Repair equipment; Engine tests

HS-010 149 Fld. 5/11; 5/17**HOW TO SWAT THE BUGS IN A NEW CAR**

by E. F. Lindsley

Published in *Popular Science* v198 n6 p90-2 (Jun 1971)

Systematic checkout by the owner can spot flaws and defects to avoid permanent damage, stop minor problems from becoming breakdowns, and save repeat visits to the shop. Inspect at once the electrical system; liquid systems; linkages and connections; under car; fasteners, seals, and hardware. Many small adjustments can be made by the owner, but if serious trouble is indicated, get the dealer's written instructions before moving the car. Have your home-mechanic actions noted in the dealer's file for your car if they might affect warranties.

Search terms: Automobile defects; Automobile maintenance; Automobile repair; Dealers; Warranties

5/12 Manufacturers, Distributors and Dealers**HS-010 150 Fld. 5/12****PSYCHOLOGY AND AUTOMOBILE ENGINEERING. 8. TESTING OPINIONS AND PRODUCTS**

Published in *Automobile Engineer* v58 n9 p348-9 (Aug 1968)

This paper deals with consumer psychology and the techniques for testing both opinions about products and the products themselves. Recall and recognition techniques are considered, as well as techniques used to study audience reaction to television and advertisements. For the testing of the products themselves, other techniques are used such as a sample of users, opinion surveys, and the concept of marginal utility. Automobile marketing research generally uses indirect techniques such as opinion surveys.

Search terms: Advertising; Public opinion; Market surveys; Opinion polls; Psychological tests; Consumer preferences

HS-010 151 Fld. 5/12**PSYCHOLOGY AND AUTOMOBILE ENGINEERING. 7. THE SOCIAL SYSTEM OF A FACTORY**

by M. P. Feldman

Published in *Automobile Engineer* v58 n8 p290-1 (Jul 1968)

The most obvious aspect of the formal structure of a factory is the line organization, i.e., the system of authority which consists of several levels from the lowest employee to the chairman of the board. There are two other organizational structures: the functional organization and the staff organization. Whereas the line structure is based on authority, the functional structure is based on the type of work done, and the staff structure on specialization. Parallel to this, there is an informal organization that exists on several levels: it is the social organization, through which people, to a large extent, acquire their attitudes, opinions, goals and ideals, and so it is also one of the fundamental

5/12 Manufacturers, Distributors and Dealers (Cont'd)

HS-010 151 (Cont'd.)

allowed to emerge, the stronger is the morale of the factory and the less the degree of absenteeism and job turnover.

Search terms: Industrial plants; Psychological factors; Social psychology; Labor; Group dynamics; Automotive industry

HS-010 152 Fld. 5/12

PSYCHOLOGY AND AUTOMOBILE ENGINEERING. 6. THE MEASUREMENT OF MORALE

by M. P. Feldman

Published in *Automobile Engineer* v58 n5 p176-8 (May 1968)

The Hawthorne surveys, begun in 1924, at the Hawthorne Works of the Western Electric Company in Chicago, highlighted the need for surveys of employee attitudes to a wide variety of topics within the factory, both to assess the effects of management decisions and to provide information on which these decisions could be based, at least partially. Investigating techniques, such as interviews and questionnaires are considered in this article. The social system and communication problems of a factory are discussed.

Search terms: Attitudes; Opinion polls; Questionnaires; Employees; Automotive industry; Psychological factors; Interpersonal communication

5/14 Occupant Protection

HS-010 153 Fld. 5/14

CHRYSLER ANNOUNCES NEW SAFETY SYSTEMS

Anonymous

Chrysler Corporation has developed a new concept in automobile crash protection: the Safety Cushion System. It consists of energy absorbing cushions. The front compartment safety cushion is an extension of the instrument panel that clears the passenger's knees and extends outward from the panel; the rear compartment cushion runs the entire width of the back of the front seat and controls the rear-seat passenger's forward motion, absorbs chest energy while holding the passenger in the rear compartment during impact. Automatic seat belts are discussed briefly and shock absorbing bumpers are mentioned.

Search terms: Restraint system effectiveness; Restraint systems; Occupant protection; Crash cushions; Impact attenuation; Automatic seat belts; Passive restraint systems; Chrysler Corp.

HS-010 154 Fld. 5/14

MOTOR VEHICLE RESTRAINING DEVICES FOR CHILDREN

by Francis A. Appoldt

New York Univ.

1965 59p 4 refs
Contract PH-86-62-165
Report no. TR-917.01

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Seven restraining devices, designed to protect a small child in the event of an automobile collision, were tested dynamically by New York University. The tests simulated both head-on and intersection collisions. The evaluation of these devices considers the ease with which the device is adjusted to fit the child and the method of attachment to the automobile. The deceleration of the anthropomorphic dummy exceeds that of the

section collision. This report also includes recommendations for improvement.

Search terms: Child restraint systems; Restraint system effectiveness; Anthropometric dummies; Deceleration tolerances; Head on collisions; Impact sleds; Child safety seats; Child seat belts; Dynamic tests; Accident simulation; Intersection collisions

HS-010 155 Fld. 5/14

SEAT BELT ROUNDTABLE I. A STATUS REPORT ON SEAT BELTS

by Chas. H. Pulley; Paul Hill; Frank Palmer; B. J. Campbell; Arch McKinlay; Russell Neff; Donald Lhotka

American Seat Belt Council

Oct 1964 13p

This report contains highlights, quotations, and digested commentary of a roundtable discussion by men prominent in the traffic safety field on the seat belt movement. What has been accomplished to date and where to go from here; what changes have come about; and what may be expected from all areas of concern: legislation, standards, public education, the auto industry, and the seat belt industry, were topics covered.

Search terms: Seat belt campaigns; Seat belt regulations; Seat belt standards; Seat belt usage; Shoulder harnesses; Federal laws; Occupant protection; Accident reports; Safety education; Automotive industry

AVAILABILITY: Corporate author

HS-010 156 Fld. 5/14

HUMAN FACTORS RESEARCH IN MOTOR VEHICLE OCCUPANT

2p 3 refs

This paper describes some results of human factors research in motor vehicle occupant restraint systems by the Office of Vehicle Systems Research in the National Bureau of Standards. Tests were conducted using human volunteer subjects, anthropomorphic dummies, and deceleration sleds to determine the safe performance of restraint systems. Some future research is mentioned.

Search terms: Anthropomorphic dummies; Impact sleds; Restraint system effectiveness; Laboratory tests; Accident simulation; Test volunteers

5/15 Propulsion Systems

HS-010 157 Fld. 5/15

THE I.C. ENGINE. IT'S NOT DOWN YET. PART 1.

by Ed Janicki

Published in *Jobber Topics* v101 n4 p90-3, 128, 132 (May 1971)

Alternatives to the internal combustion engine are described. The advantages and disadvantages of steam power, free piston engines, gas turbines, and fuel cells are discussed. The free piston engine can run on many types of fuel.

Search terms: Propulsion systems; Free piston engines; Gas turbine engines; Fuel cells; Steam engines; Steam automobiles

HS-010 158 Fld. 5/15

THE BRIGHT FUTURE OF THE ROTARY ENGINE

Anonymous

Published in *Road Test* v7 n8 p19-25 (Jun 1971)

The development of the Wankel engine is described. Its use by European, British, Japanese, and American auto manufacturers is discussed, and the licensing arrangements are outlined. The fuel and emissions aspects of the Wankel are outlined.

Search terms: Gasoline mileage; Wankel engines; Rotary engines; Internal combustion engines; Lead free gasoline; Engine performance; Engine design; European vehicles; Japanese vehicles; British vehicles

5/18 Steering Control System

HS-010 159 Fld. 5/18

THE CORNERING COMPLIANCE CONCEPT FOR DESCRIPTION OF DIRECTIONAL CONTROL (HANDLING) PROPERTIES

by R. T. Bundorf; R. L. Leffert

General Motors Proving Ground

n.d. 47p 6 refs
Report no. GM-Eng-Pub-2771

The automobile directional control system has never been easily simplified, and the description of any given vehicle's design or engineering properties has necessarily been complex. In this report a concept for combining most vehicle design parameters into two terms, front and rear cornering compliances, is proposed. Analysis and simulation results are presented to verify the correspondence between the front and rear cornering compliance parameters and vehicle steady state and transient responses. Transient response times for yaw velocity and lateral acceleration are presented as functions of front and rear cornering compliances. These results indicate the effectiveness of understeer in lowering transient response times. They also indicate that shorter response times are more effectively obtained through added understeer at the rear suspension than with front suspension understeer.

Search terms: Cornering; Mathematical analysis; Mathematical models; Automobile handling; Simulation models; Steering; Understeer; Steady state; Lateral acceleration; Yaw; Oversteer; Sideslip; Rear wheels; Front wheels; Front suspension systems; Rear suspension systems

HS-010 160 Fld. 5/18; 5/4

THE ITALIAN WAY TO SAFETY

by M. Bencini

Published in *Institution of Mechanical Engineers Proceedings* 1969-70 v184 pt2A n15 p315-20

Confronted with the high accident rate on Italian roads, the automotive engineers in Italy feel that active or primary safety is of basic importance; namely, those features that provide the automobile with the highest possible degree of controllability in any circumstances. Of course, passive or secondary safety is not neglected as it reduces the consequences of the first collision (against another vehicle or obstacle), namely, the injuries which occupants suffer during the second collision from impacts against the passenger compartment interior. Exhaustive design and testing development work is going on. Other factors involving limitations in the specific performance of engines are discussed. The vehicle needs a high degree of stability to hold the road. Factors involving stability are discussed.

Search terms: Italy; Accident rates; Secondary collisions; Impact protection; Steering; Vehicle stability; Static margin; Safety design; Automobile design; Engine operating conditions; Air fuel ratio; Vehicle control; Occupant protection

HS-010 161 Fld. 5/18; 5/20**SKID-STEERING. PART TWO:
THE NOMOGRAM**

by K. R. Weiss

Published in *Automobile Engineer* v61 n6 p36-8 (Jun 1971)

Skid-steering theory is extended here to apply to wheeled as well as tracked vehicles. The solution developed includes the effects of both longitudinal and lateral components of the force acting on the vehicle's center of gravity. Use of a nomogram is suggested to replace trial and error methods and show clearly the effects of varying longitudinal and lateral forces on normalized track forces. In this second part, use of the nomogram is described and the mathematical basis given for solution of the vehicle equations with a computer.

Search terms: Mathematical analysis; Mathematical models; Tracked vehicles; Off the road vehicles; Vehicle dynamics; Equations of motion; Nomographs; Skidding; Lateral force; Longitudinal force; Vehicle center of gravity

HS-010 162 Fld. 5/18; 5/20; 4/7**SKID-STEERING [PT. 1]**

by K. R. Weiss

Published in *Automobile Engineer* v61 n4 p22-5 (Apr 1971)

1 ref

Skid-steering theory is extended here to apply to wheeled as well as tracked vehicles. The solution developed includes the effects of both longitudinal and lateral components of the force acting on the vehicle's center of gravity. Use of a nomogram is suggested to replace trial and error methods and show clearly the effects of varying longitudinal and lateral forces on normalized track forces.

ehicles; Vehicle dynamics; Equations of motion; Nomographs; Lateral force; Longitudinal force; Vehicle center of gravity; Skidding; Steering

5/20 Trucks and Trailers**HS-010 163 Fld. 5/20; 5/4****TRANSMISSIONS FOR THE 70'S.
2. MATCHING THE TRANSMIS-
SIONS TO THE ENGINE**

by Paul Brockington

Published in *Commercial Motor* v133 n3414 p36-8 (30 Apr 1971)

Transmissions for truck engines are discussed. Aspects described include torque, overgearing, gear ratios, advantages of gasoline engines over diesels in transmission matching, faster journey times, and engine speeds.

Search terms: Truck performance; Transmissions; Engine operating conditions; Engine speeds; Gears; Turbocharging; Travel time; Torque; Diesel engines

5/22 Wheel Systems**HS-010 164 Fld. 5/22****WIRE TIRE CORDS**

by James M. Fenner

Published in *Rubber Age* v103 n5 p58-63 (May 1971)

Steel wire cord may be one of the most important tire-reinforcing materials of the 1970's, although its development began before 1940. The physical properties of wire cord are described, including tensile strength, deflection, stress-strain curves, and modulus of elasticity. These properties are compared to those of fiberglass.

Search terms: Tire cords; Tire cord

glass; Tensile strength; Modulus of elasticity; Deflection; Stress strain characteristics; Physical properties

HS-010 165 Fld. 5/22**GENERAL MOTORS PROVING
GROUND TIRE CORNERING
TEST VEHICLE**

by A. D. Cortese; C. S. Rockafellow

General Motors Proving Ground

1971 12p 2 refs
Report no. GM-Eng-Pub-4410

Prepared for presentation at SAE Automotive Engineering Congress, Detroit, 11-15 Jan 1971.

This paper discusses a prototype device now under development to measure cornering traction and cornering-braking traction on test road surfaces, as well as real world roads. A description is given of the system design and capabilities, including operating features, transducing elements, tracking stabilization, and data signal processing. The equipment will measure cornering traction capabilities as influenced by dynamic slip angle, camber angle, braking, speed, road surface, and road surface contaminants. Comparisons are made with data obtained from laboratory equipment and the PG Model II Friction Traction Trailer.

Search terms: Cornering; Camber; Tire slip motion; Transducers; Braking forces; Tire performance; Tire traction; Coefficient of friction; Speed; Road surfaces; Tire tests; Lateral force; Tire test equipment; Tracking

HS-010 166 Fld. 5/22; 4/1**SAFE TIRES SAVE LIVES. RE-
PORT OF THE JOINT LEGISLATIVE
COMMITTEE ON MOTOR
VEHICLES AND TRAFFIC
SAFETY**

1964 64p
Report no. Leg-Doc-(1964)-73

The traffic safety problem is outlined. Tire safety was the committee's 1964 priority, and the effort to set up tire standards is described. The committee's 1965 program plans pertain to some thirteen other aspects of vehicle safety. The texts of New York State laws pertaining to vehicle safety are included.

Search terms: Tire industry; Tire performance; Tire safety; Tire standards; Tire tests; State laws; Vehicle safety; Highway safety

HS-010 167 Fld. 5/22; 5/11; 5/20

TIRE INSPECTION GUIDE

Tire Industry Safety Council

[n.d.] 4p

This instruction leaflet is in two parts: recommended procedures for the safety inspection and operation of tires used on trucks, buses, trailers, and multi-purpose passenger vehicles; recommended procedures for the safety inspection and operation of tires used on passenger cars, station wagons, and multipurpose passenger vehicles. Tire inflation pressure, causes for replacement, and safe operating requirements are given for each type of vehicle tire.

Search terms: Tire inflation pressure; Truck tires; Tire wear; Tire tread depths; Tire maintenance; Tire inspection

HS-010 168 Fld. 5/22; 5/18

SMALL DIFFERENCE IN TIRE PROPERTIES = LARGE DIFFERENCES IN VEHICLE HANDLING

by D. L. Nordean; A. D. Cortese

Published in *SAE Journal* v71 n7 p83-90 (Jul 1963)

Vehicle handling is sensitive to tire performance characteristics (lateral force

ment), which in turn depend on slip angle, camber angle, and normal force. A tire test apparatus is described. Measured quantities were tractive force, lateral force, normal force, overturning moment, rolling resistance moment, aligning torque, and rolling height. Control variables were slip angle, camber angle, wheel torque, inflation pressure, road surface, and road temperature. Wet or dry simulated road surfaces may be used. Experimental curves show interrelations among various parameters. The effects of tire performance on vehicle stability and response are discussed.

Search terms: Tire performance; Tire rolling resistance; Tire force measurement; Tire forces; Tire side forces; Road surfaces; Tire inflation pressure; Tire moments; Tire properties; Tire slip motion; Torque; Tire traction; Vehicle stability; Vehicle handling; Tire skid resistance; Tire test equipment; Tire tests; Camber; Lateral force

NHTSA DOCUMENTS

NHTSA Contractors Reports

HS-800 505 Fld. 2/9; 4/5; 1/5

A STUDY OF THE EFFECTS OF LAW ENFORCEMENT ON TRAFFIC FLOW BEHAVIOR. FINAL REPORT

by Kent B. Joscelyn; Thomas H. Bryan; Donald M. Goldenbaum

Indiana Univ.

1971 278p 83 refs
Contract FH-11-7476
Report no. FH-11-7476-71-1

Results of a study on the reactions of traffic flow to police vehicle stimuli are presented. Both moving and stationary state police vehicles were used in the examination to determine their effects on a variety of traffic flow measures. Six stationary enforcement vehicle configurations, representing various intensities of police activity, were included. A special computer-sensor

traffic flow data. Both mean speed and percentage of speed violators were affected by the enforcement vehicles. In terms of absolute reductions in these measures, the immediate effects were more pronounced for the more-threatening than for the less-threatening, stationary vehicle configurations.

Search terms: Traffic flow; Traffic law enforcement; Law enforcement effect on accident rates; Data processing; Police vehicles; Driver behavior; Reviews; Vehicle detectors; Speed studies; Traffic law violations; Time of day; Variance analysis

AVAILABILITY: NTIS

HS-800 509 Fld. 2/11

TRAFFIC RECORDS SURVEY OF PRIVATE ENTERPRISES. FINAL REPORT

Booz Allen Applied Res., Inc.

1971 75p 12 refs
Contract FH-11-7626

The purpose of this survey was to identify record files related to motor vehicle and traffic safety that are maintained by private enterprises. Approximately 100 organizations were contacted in 11 different categories of private industry. The record files contained data on accidents, drivers, mechanics, and vehicle maintenance and repair. The survey was conducted at 2 levels of intensity: high-intensity inventories provided an in-depth view of the traffic records of a firm in each category; low-intensity inventories identified record files of other organizations in the category, so that similarities and differences in record-keeping practices were highlighted. Results of this survey indicate that the only categories of industry maintaining useful records are insurance companies, motor carriers, universities, research associations, manufacturers, and medical institutions. The firms in a category usually maintain similar elements of information in their traffic records, though the way the data

NHTSA Contractors Reports (Cont'd.)

HS-800 509 (Cont'd.)

Search terms: Accident records; Traffic records; Insurance industry; Universities; Automobile clubs; Manufacturers; Local government; Motor carriers; Medical institutions; Surveys; Associations

AVAILABILITY: NTIS

HS-800 513 Fld. 5/4; 5/20

HAZARDOUS MATERIALS TRANSPORTATION INTRUSION PROTECTION FOR HAZARDOUS CARGO TANKS

by L. M. Krasner; S. A. Wiener; J. L. Buckley

Factory Mutual Res. Corp.

1971 42p 19 refs
Contract FII-11-7269
Report no. FMRC-19250

Tanker population data was collected along with data resulting from accidents involving over-the-road tank carriers of flammable liquids. This data was evaluated and analyzed with respect to incidence of lateral intrusion. Significant results include: (1) there are approximately 324,000 tank trucks in the country, of which 84,000 are combinations; (2) there are approximately 46,000 tank combinations meeting flammable liquid specifications, of which 45% report to DOT; (3) lateral intrusion is not a significant problem; approximately 1% of tanker accidents involved lateral intrusion; (4) fire on tankers is a significant problem; 5% of tanker accidents involved fire and resulted in 24.4% of tanker accident deaths; and (5) onboard fire suppressing systems are feasible and desirable.

Search terms: Tank trucks; Hazardous materials; Accident caused fires; Accident studies; Truck accidents; Vehicle fires; Fire extinguishers; Side

Flammability; Fire fighting; Accident studies; Vehicle explosions

AVAILABILITY: NTIS

HS-800 515 Fld. 5/14; 4/7

DEPLOYABLE HEAD RESTRAINTS. FINAL REPORT

by J. W. Melvin; J. H. McElhaney

Michigan Univ. Hwy. Safety Res. Inst.

1971 142p 30 refs
Contract FII-11-7612
Report no. HSRI-71-103

Head restraint systems that automatically deploy can prevent crash injury without significantly compromising driver vision during normal vehicle operations. This program involved defining the system requirements, evaluating crash sensors and restraint system configurations, selecting and designing systems, and then performing a testing, development, and demonstration program on prototypes. Two basic types of systems were designed and built; one was inflatable and the other was a rigid sliding device. Both systems were subjected to a series of impact sled tests utilizing anthropometric dummies. Deployable head restraints were demonstrated to be technically feasible and capable of performance better than conventional fixed head restraints. Recommendations were made regarding general performance requirements for deployable head restraints and associated seat back structures. The HSRI two-dimensional crash victim computer model was used in this study.

Search terms: Head restraints; Sensors; Head movement; Head protection; Inflatable structures; Whiplash injuries; Occupant protection; Seat back kinematics; Anthropometric dummies; Impact tests; Impact sleds; Performance tests; Popup head restraints; Rear end collisions; Rear visibility; Computerized simulation; Simulation models

HS-800 531 Fld. 5/4

INVESTIGATION OF MOTOR VEHICLE PERFORMANCE STANDARDS FOR CRASH-WORTHINESS OF VEHICLE STRUCTURE. PHASE I. FINAL REPORT.

Fairchild-Hiller Corp.

1968 260p 483 refs
Contract FII-11-6575
Report no. FIIH-3445-1; PD-070R-2002

This program is a study to develop and document a detailed text on all aspects of structural design in motor vehicles related to protecting occupants of vehicles from serious injuries in crashes. This knowledge will provide a basis for safety standards for the performance of motor vehicle structures and will assist with certification procedures. The program discussion is divided into plans for: state-of-the-art; establishing performance criteria; establishing qualification procedures; establishing performance standards; development of analytical tools and techniques; updating and expanding data base; and consultation liaison during advanced notice period of proposed rule making.

Search terms: Mathematical models; Energy absorbing systems; Dynamic loads; Accident statistics; Structural design; Structural analysis; Impact tolerances; Performance characteristics; Safety cars; Impact tests; Vehicle weight; Deceleration tolerances; Human body impact tolerances; Automobile bodies; Simulation models; Acceleration tolerances; Statistical analysis; Injuries by vehicle model; Design standards; Crashworthiness; Rule making; Injury severity; Automobile design; Safety design; Occupant protection; Automobile safety standards; Automobile performance; Injury prevention; State of the art studies; Reviews; Head on collisions; Side impact collisions; Rear end collisions; Rollover accidents; Dynamic tests



executive summary

SYNOPSIS OF A RECENTLY RELEASED NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION RESEARCH REPORT

HIGHWAY SAFETY OCCUPATIONAL OPPORTUNITIES

The purpose of this contract was to establish a project for determining the feasibility of producing a highway safety occupational "positions available" publication; to develop and test various literary formats that might be employed to provide the desired highway safety occupational information; produce and carry out research with an experimental design of highway safety occupational information manuscript, and provide the National Highway Traffic Safety Administration with a fully tested model of a highway safety occupational opportunities publication.

Contract No. FH-11-7623
Highway Users Federation for
Safety and Mobility
1776 Massachusetts Avenue, N.W.
Washington, D.C. 20036

DOT/HS-800 579 Highway Safety Occupational Opportunities (Final Report)
DOT/HS-800 582 Highway Safety Occupational Opportunities Manual (Draft)

Award Amount: \$30,608.00
Contract Period: June 30, 1970
to December 31, 1970

General Comments

A major domestic challenge facing the United States is the need for increased highway safety and mobility. Greater numbers of automobiles, trucks and buses are being pressed into service every day in an effort to move people and goods from one place to another. This effort entails constructing roads; planning and operating traffic movement systems; developing regulations, facilities and devices; informing, educating and controlling drivers; and many other activities.

To carry out these activities, federal, state and local governments presently employ more than one million men and women as highway safety workers. Further, to achieve the highway safety goals identified in the Highway Safety Act of 1966, an estimated one-half million additional highway safety workers must be recruited and trained.

A review of the literature has revealed that since the passage of the 1966 Highway Safety Act, a substantial amount of the highway safety manpower literature has been prepared. Publications extolling the need for developing traffic specialists and traffic technicians, and highway safety personnel were developed and are now being utilized to communicate the need for

field. Curriculum guidelines, course outlines and other instructional aids have also been developed and distributed to potential users. Although the supply of training literature has increased significantly, studies have shown that the implementation of training programs have not kept pace.

This observation stimulated informal investigation on the part of several government and private agencies. The initial conclusion reached by most investigators was; insufficient funds had been identified for highway safety manpower training. This included the lack of money to employ instructional personnel, purchase equipment and provide facilities. Although this conclusion proved tenable in most cases, some training institutions reported an ample supply of instructional resources, including fellowship monies, but a decided inability to attract qualified students. Staff of the Highway Users Federation for Safety and Mobility explored many of these reports and found them to be creditable. These findings and other observations led to a hypothesis that a communications void existed between the highway safety agencies, the employer, and the prospective highway safety worker, the student.

To test this hypotheses, the Highway Users Federation established a highway safety career information work-

ing committee composed of highway safety specialists, career counselors and school administrators, and proceeded to examine this possible communications void. Data obtained during the examination showed that a communications void did exist and ultimately designed a project to improve the dissemination of highway safety career information via an audio-visual program.

Procedure and Methodology

To achieve the purpose of the project the tasks performed were:

- Carried out an indepth investigation to determine the need and usefulness of additional occupational information in the highway safety field. Data were gathered from career counselors, highway safety administrators and others in the highway safety field by direct interview. A data gathering format was used that also produced valuable information regarding the possible design and content of an occupational publication.
- Developed a modual plan for preparing and testing experimental designs for a highway safety occupational opportunities publication.
- Conducted a search of the highway safety and highway safety oriented career literature. In addition, similar publications in other career fields were reviewed for possible ideas relating to format, nature of content, reading level, etc. A totally adaptable format was not found, however, selected ideas were included in the project publication.
- Based on work previously performed and the conclusion arrived at as a result of the findings, prepared and submitted recommendations on the feasibility of making a distinction between a baccalaureate career information booklet and non-baccalaureate occupations publication.
 - Experimentation with possible publication designs showed that a single publication covering the full spectrum of highway safety careers would be more efficient and less costly than a two booklet plan. Thus, the Federation's recommendation that the occupational information should be published in a single booklet was approved.
- Prepared a taxonomy of highway safety job titles. Job titles included in the taxonomy were selected on the basis of their exclusive relationship to the field of highway safety, and the estimated demand for trained workers.
- Prepared a working outline of the publication that included the introduction and summary chapters, related references and appendices. Included in was the design of an informational format for each occupation listed in the highway safety occupation taxonomy.
- Developed a model highway safety occupational opportunities manual that utilized a matrix system of job related information. Model manual was reviewed by highway safety experts with experience in one or more of the highway safety disciplines included in the manuscript.
- Prepared and submitted evaluation drafts of the model occupational opportunities publication to one hundred and twenty-six career counselors. Career counseling situations were simulated, and the counselors were required to utilize the highway safety occupational opportunities manual to obtain job related information for the inquiring student or job seeker. The counselors were asked to carry out a minimum of three simulated counseling sessions and record their findings on a specially designed manual evaluation form.
- Scored and tabulated the numerical section of the manual evaluation forms. Written comments were summarized and included in a composite evaluation.

MAJOR CONCLUSIONS AND RECOMMENDATIONS

Conclusions

The ultimate goal of the project was to produce a model of a publication that would contribute to the knowledge about occupational opportunities in the highway safety field, and provide a resource of current highway safety occupational information. To achieve the ultimate goal, several tasks and sub-tasks as stated in the Procedures and Methodology above were carried out for the purpose of establishing an equitable project base.

The following conclusions are founded upon experimental evidence and observations:

- There exists substantial evidence to support the need for increased occupational information in the highway safety field. The search of the literature

phase of the feasibility study showed that *Careers in Highway Traffic Safety* was the only multi-disciplinary highway safety career booklet to be published. The search also revealed that most single-discipline career publications related to the highway safety fields, such as, driver education, traffic engineering, motor vehicle administration are outdated. Only the police career field has been dealt with within the past four years, and the police traffic services career data in the available publications are very limited.

- No special effort was made to determine the extent of the demand for additional occupational information in the highway safety field, though randomly selected samples showed career counselors and administrators in the traffic field to be highly favorable to the idea of multi-disciplinary highway safety occupational opportunities publication.
- It was concluded that there is a need for an occupational opportunities publication in the highway safety field, and that the production of such a publication is feasible.
- The development and testing phase of the project led to the conclusion that a multi-disciplinary highway safety occupational opportunities manual could be produced that would offer the reader direct access to specific job title information without the redundancy of generalities. The structure ultimately agreed upon to achieve this design concept, entails the utilization of a matrix system of disciplinary grouping and job title identification.
- It was concluded that the occupational opportunities publication would be more useful in a manual style that included the qualities and concepts to be the most efficient and desirable.
 - As a result of the evaluation efforts carried out it was concluded that a highway safety occupational opportunities publication, would make a significant contribution to the highway safety career information literature. The evaluation evidence showed that career counselors and other "users" from within the highway safety field, would welcome the availability of a more comprehensive source of highway safety occupational information.

of this project have produced substantial evidence to support a recommendation for the immediate preparation and publication of a highway safety occupational opportunities manual.

- It is recommended that the publication should adopt the format and style utilized in the project "model" publication, and that the ultimate occupational opportunities manual include all job titles and job related information given in the "model."
- The final format for the "model" occupational opportunities manual is reference oriented, the prime users of the publication are expected to be career counselors, employment counselors, high school and college teachers and students, and highway safety administrators and supervisors.
- It is recommended that a "Highway Safety Occupational Opportunities" brochure be developed and given wide distribution. Such a brochure would provide the reader with highlighted highway safety occupational information that had been drawn from the contents of the occupational opportunities manual. Brochure should refer to the manual as needed, but otherwise be fully autonomous.
- The evaluation phase of the project produced several suggested uses for sections of the manual. The following suggestions were explored and found to be practical and effective applications of the manual content.
 - Sections of the "Highway Safety Occupational Opportunities Manual" that provide specific information relative to only one discipline (e.g., driver education, traffic engineering, police traffic services), should be inexpensively reproduced for distribution to those persons seeking occupational information about a particular field of highway safety.
 - Specific job title information contained in the manual should be duplicated and made available to employment and career counselors as handouts for students and others seeking employment information.
 - Modify portions of the manual's highway safety occupational information to comply with the editorial style used in the "Occupational Outlook Handbook," and make this information available to the Department of Labor for future

Recommendations

The Contract Manager has certified that the contractor's work has been satisfactorily completed and that all contractual obligations have been met.

The opinions, findings, and conclusions expressed in this summary are those of the contractor and not necessarily those of the National Highway Traffic Safety Administration.

Availability: NTIS; this report may be ordered in paper copy (PC) or in microfiche (MF). Order DOT/HS-800 579. For the Manual order DOT/HS-800 582, also in (PC) or (MF).

U.S. DEPARTMENT OF TRANSPORTATION

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